CIVIL EXPERTS CONSULTANTS AND TESTING CENTER

JobNo: CECTC-MS-PMC-2016-17

Date : 07.11.2016

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Client : **Executive Engineer,** Dasarahalli Division, BBMP, Bangalore.

Agency : **Sri.Muraliswamy,** Contractor, Bangalore.

Name of Work : Improvements and Asphalting of Ward Roads & Connecting Roads in Ward No. 14 & 15 of Shettyhalli Sub Division Dasarahalli zone. Package No. DZ 2016-16-(02) (19 works), BBMP, Bangalore.

Reference : EE/DD/PACKAGE/WO/75/2016-17 Dated:03.10.2016

Technical Reference : IS 2386(Part 1) 1963 (RA 2007) and MORTH 5th Revision

Type of Mix : Wet Mix Macadam

Date of Testing : 07.11.2016

Passing through IS Sieve, mm	Retained On IS Sieve, mm	Weight of Sieved Fraction (W) gms		Proportion of Size range in the sample, X = 100xW/ΣW		Weight of 200 pieces of aggregates of the range, (P) in gms		Thickness gauge size, mm	Weight of flaky particles (F)in gms		Weight of fraction consisting of at least 200 Pieces in gms		Length gauge size in mm	Weight of aggregates in each fraction retained on Length gauge in gms	
63.00	50.00	W1		X1		P1		33.90	F1		P1		-	E1	
50.00	40.00	W2	3147	X2	20.25	P2	1789	27.00	F2	311	P2	1789	81.00	E2	211
40.00	31.50	W3	2741	X3	17.64	P3	1523	21.50	F3	184	P3	1523	58.00	E3	168
31.50	25.00	W4	2456	X4	15.80	P4	1147	16.95	F4	164	P4	-	-	E4	-
25.00	20.00	W5	2147	X5	13.82	P5	746	13.50	F5	121	P5	746	40.50	E5	132
20.00	16.00	W6	1896	X6	12.20	P6	736	10.80	F6	92	P6	736	32.40	E6	99
16.00	12.50	W7	1526	X7	9.82	P7	610	8.55	F7	87	P7	610	25.50	E7	74
12.50	10.00	W8	914	X8	5.88	P8	532	6.75	F8	60	P8	532	20.20	E8	46
10.00	6.30	W9	713	X9	4.59	P9	369	4.89	F9	55	P9	369	14.70	E9	32
		Σ W	**15540.0**			**ΣP**	**7452.0**		**ΣF**	**1074.0**	**ΣP**	**6305.0**		**ΣE**	**762.0**

Result : Flakiness Index = **14.41%**

Elongation Index = **12.09%**

Result : Combined Flakiness & Elongation index **26.50%**

Comments: → Maximum Combined flakiness and Elongation indices value for Wet mix Macadam is 35%.

Note:

→ The results indicated above are based on the tests carried out on the samples received in the laboratory.

For Civil Expert

Authorised Signature

QUALITY CONTROL REPORTS FOR

DENSE GRADED BITUMINOUS MACADAM (DBM)

CIVIL XPERTS
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NABL ACCREDITED AS PER ISO/IEC 17025:2005

Job No.: CECTC-MS-PMC-2016-17 Date: 15.11.2016

TEST REPORT

Client	:	**Executive Engineer,** Dasarahalli Division, BBMP, Bangalore.
Agency	:	**Sri.Muraliswamy,** Contractor, Bangalore.
Name of the work	:	Improvements and Asphalting of Ward Roads & Connecting Roads in Ward No. 14 & 15 of Shettyhalli Sub Division Dasarahalli zone. Package No. DZ 2016-16-(02) (19 works), BBMP, Bangalore.
		EE/DD/PACKAGE/WO/75/2016-17 Dated:03.10.2016
Source of location	:	Hot mix Plant, Bangalore
Date of testing	:	15.11.2016

The results of the tests conducted on the bitumen sample using for Dense Graded Bituminous Macadam

Sl. No	Description	Test Result	Requirement as per IS:73:2013
1	Penetration at 25 ^{0}C, 1/10 mm	68	60 to 70
2	Softening point, ^{0}C	48	Min. 45
3	Ductility at 27^{0}C, cm	100 >	Min. 50
4	Flash Point, ^{0}C	312	Min. 220

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For Civil Expert

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ಟಿ.ದಾಸರಹಳ್ಳಿ ಉಪ-ವಿಭಾಗ
ಬಾಗಲಗುಂಟೆ, ಬೆಂಗಳೂರು

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NABL ACCREDITED AS PER ISO/IEC 17025:2005

Job No.: CECTC-MS-PMC-2016-17 **Date:** 15.11.2016

Aggregate Impact Value
IS: 2386 Part IV

Client	**Executive Engineer,** Dasarahalli Division, BBMP, Bangalore.
Agency	**Sri.Muraliswamy,** Contractor, Bangalore.
Name of the Work	Improvements and Asphalting of Ward Roads & Connecting Roads in Ward No. 14 & 15 of Shettyhalli Sub Division Dasarahalli zone. Package No. DZ 2016-16-(02) (19 works), BBMP, Bangalore.
Name of the Work	EE/DD/PACKAGE/WO/75/2016-17 Dated:03.10.2016
Source / Location	Hot mix Plant, Bangalore
Type of Mix	Dense Graded Bituminous Macadam
Date of Testing	15.11.2016

Sl No.	Details	Trial No. 1	Trial No. 2	Trial No. 3	Average
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	391	389	390	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	85	83	84	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	306	306	306	
4	Aggregate Impact value = percent fines	21.74	21.34	21.54	
	100* (W_2/W_1)%				21.54

Comments:

→ Maximum allowable Aggregate Impact value for Dense Graded Bituminous Macadam is 27%

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CIVIL EXPERTS CONSULTANTS AND TESTING CENTER

JobNo: CECTC-MS-PMC-2016-17 Date : 07.11.2016

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Client : **Executive Engineer,** Dasarahalli Division, BBMP, Bangalore.

Agency : **Sri.Muraliswamy,** Contractor, Bangalore.

Name of Work : Improvements and Asphalting of Ward Roads & Connecting Roads in Ward No. 14 & 15 of Shettyhalli Sub Division Dasarahalli zone. Package No. DZ 2016-16-(02) (19 works), BBMP, Bangalore.

Reference : EE/DD/PACKAGE/WO/75/2016-17 Dated:03.10.2016

Technical Reference : IS 2386(Part 1) 1963 (RA 2007) and MORTH 5th Revision

Type of Mix : Wet Mix Macadam

Date of Testing : 07.11.2016

Passing through IS Sieve, mm	Retained On IS Sieve, mm	Weight of Sieved Fraction (W) gms		Proportion of Size range in the sample, X = 100xW/ΣW		Weight of 200 pieces of aggregates of the range, (P) in gms		Thickness gauge size, mm	Weight of flaky particles (F)in gms		Weight of fraction consisting of at least 200 Pieces in gms		Length gauge size in mm	Weight of aggregates in each fraction retained on Length gauge in gms	
63.00	50.00	W1		X1		P1		33.90	F1		P1		-	E1	
50.00	40.00	W2	3147	X2	20.25	P2	1789	27.00	F2	311	P2	1789	81.00	E2	211
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31.50	25.00	W4	2456	X4	15.80	P4	1147	16.95	F4	164	P4	-	-	E4	-
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20.00	16.00	W6	1896	X6	12.20	P6	736	10.80	F6	92	P6	736	32.40	E6	99
16.00	12.50	W7	1526	X7	9.82	P7	610	8.55	F7	87	P7	610	25.50	E7	74
12.50	10.00	W8	914	X8	5.88	P8	532	6.75	F8	60	P8	532	20.20	E8	46
10.00	6.30	W9	713	X9	4.59	P9	369	4.89	F9	55	P9	369	14.70	E9	32
		ΣW	**15540.0**			**ΣP**	**7452.0**		**ΣF**	**1074.0**	**ΣP**	**6305.0**		**ΣE**	**762.0**

Result : Flakiness Index = **14.41%**

Elongation Index = **12.09%**

Result : Combined Flakiness & Elongation index 26.50%

Comments: → Maximum Combined flakiness and Elongation indices value for Wet mix Macadam is 35%.

For Civil Expert

Authorised Signature

Note:

→ The results indicated above are based on the tests carried out on the samples received in the laboratory.

CIVIL EXPERTS CONSULTANTS AND TESTING CENTER

Job No.: CECTC-MS-PMC-2016-17 Date : 15.11.2016

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Client : **Executive Engineer,** Dasarahalli Division, BBMP, Bangalore.

Agency : **Sri.Muraliswamy,** Contractor, Bangalore.

Name of Work : Improvements and Asphalting of Ward Roads & Connecting Roads in Ward No. 14 & 15 of Shettyhalli Sub Division Dasarahalli zone. Package No. DZ 2016-16-(02) (19 works), BBMP, Bangalore.

Name of Work : EE/DD/PACKAGE/WO/75/2016-17 Dated:03.10.2016

Technical Reference : IS 2386(Part 1) 1963 (RA 2007)

Type of Mix : Dense Graded Bituminous Macadam

Date of Testing : 15.11.2016

Passing through IS Sieve, mm	Retained On IS Sieve, mm	Weight of Sieved Fraction (W) gms		Proportion of Size range in the sample, X = 100xW/ΣW		Weight of 200 pieces of aggregates of the range, (P) in gms		Thickness gauge size, mm	Weight of flaky particles (F)in gms		Percentage by Weight of flaky aggregates in gms Y= 100xF/P	Weighed Percentage of flaky aggregates in gms XY=X × Y	Weight of fraction consisting of at least 200 Pieces in gms		Length gauge size in mm	Weight of aggregates in each fraction retained on Length gauge in gms	
63.00	50.00	W1		X1		P1		33.90	F1				P1		-	E1	
50.00	40.00	W2		X2		P2		27.00	F2				P2		81.00	E2	
40.00	31.50	W3	2585.0	X3	22.30	P3	1985.0	21.50	F3	285.0	14.36	320.12	P3	1985.0	64.40	E3	165.0
31.50	25.00	W4	2416.0	X4	20.84	P4	1847.0	16.95	F4	235.0	12.72	265.13	P4	-	-	E4	114.0
25.00	20.00	W5	2189.0	X5	18.88	P5	1562.0	13.50	F5	185.0	11.84	223.62	P5	1562.0	40.50	E5	102.0
20.00	16.00	W6	1639.0	X6	14.14	P6	1026.0	10.80	F6	166.0	16.18	228.72	P6	1026.0	32.40	E6	92.0
16.00	12.50	W7	1415.0	X7	12.20	P7	914.0	8.55	F7	101.0	11.05	134.86	P7	914.0	25.60	E7	80.0
12.50	10.00	W8	925.0	X8	7.98	P8	411.0	6.75	F8	90.0	21.90	174.71	P8	411.0	20.20	E8	72.0
10.00	6.30	W9	425.0	X9	3.67	P9	178.0	4.89	F9	65.0	36.52	133.86	P9	178.0	14.70	E9	55.0
		Σ W	**11594.0**								**ΣXY**	**1481.02**	**ΣP**	**6076.0**		**ΣE**	**680.0**

Result : Flakiness Index = **14.81%**

Elongation Index = **11.19%**

Result : Combined Flakiness & Elongation index **26.00%**

Comments: Maximum Combined flakiness and Elongation indices value for Dense Graded Bituminous Macadam is 35%

Note:

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Job No.: CECTC-MS-PMC-2016-17 Date: 15.11.2016

Specific Gravity And Water Absorption Test

IS: 2386 Part III

Client	**Executive Engineer,** Dasarahalli Division, BBMP, Bangalore.
Agency	**Sri.Muraliswamy,** Contractor, Bangalore.
Name of the Work	Improvements and Asphalting of Ward Roads & Connecting Roads in Ward No. 14 & 15 of Shettyhalli Sub Division Dasarahalli zone. Package No. DZ 2016-16-(02) (19 works), BBMP, Bangalore.
Name of the Work	EE/DD/PACKAGE/WO/75/2016-17 Dated:03.10.2016
Type of Mix	Dense Graded Bituminous Macadam
Date of Testing	15.11.2016

Sl. No.	Details	Notation	Test Number			Mean Value
			Test 1	Test 2	Test 3	
1	Weight of aggregate suspended in water with the basket	W_1 g	2022	2020	2021	
2	Weight of basket suspended in water	W_2 g	750	750	750	
3	Weight of saturated aggregate in water	$(W_1 - W_2) = W_s$ g	1272	1270	1271	
4	Weight of saturated surface dry aggregate in air	W_3 g	2012	2010	2011	
5	Weight of water equal to the volume of the aggregate	$(W_3 - W_S)$ g	740	740	740	
6	Weight of oven dried aggregate	W_4 g	2004	2001	2003	
7	Specific Gravity	$W_4/(W_3-W_S)$	2.708	2.704	2.707	2.706
8	Apparent Specific gravity	$W_4/(W_4-W_S)$	2.738	2.737	2.736	2.737
9	Water Absorption	$((W_3-W_4)*100)/W_4$	0.40%	0.45%	0.40%	0.42%

Comments:

→ Maximum allowable Aggregate Water absorption value for Dense Graded Bituminous Macadam is 2.0%

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NABL ACCREDITED AS PER ISO/IEC 17025:2005

Job No.: CECTC-MS-PMC-2016-17 Date: 16.11.2016

TEST REPORT ON STABILITY OF MIX

Client	:	**Executive Engineer,** Dasarahalli Division, BBMP, Bangalore.
Agency	:	**Sri.Muraliswamy,** Contractor, Bangalore.
Name of the work	:	Improvements and Asphalting of Ward Roads & Connecting Roads in Ward No. 14 & 15 of Shettyhalli Sub Division Dasarahalli zone. Package No. DZ 2016-16-(02) (19 works), BBMP, Bangalore.
		EE/DD/PACKAGE/WO/75/2016-17 Dated:03.10.2016
Source of location	:	Hot mix Plant, Bangalore
Type of Mix	:	Dense Graded Bituminous Macadam
Date of testing	:	15.11.2016

The results of the tests conducted on the Dense Graded Bituminous Macadam sample are as follows:

Sl. No	Description	Test Result 1	Test Result 2	Requirement as per MORTH (Table 500-11)
1	Marshal Stability, Kn	10.11	9.89	9 Kn (min)
2	Marshal flow, mm	3.35	3.26	2 – 4
3	Percent air voids in Mix	4.52	4.10	3 – 5
4	Percent voids in mineral aggregates	12.96	12.55	11 - 13
5	Percent voids filled with Bitumen	70.41	69.36	65 – 75
6	Density, g/cc	2.26	2.27	--

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